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Eye Movements among Female Taekwondo Players with High and Low Levels

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Abstract: Sports vision is conceived as a group of techniques directed to preserve and improve the visual function with a goal of enhancing sports performance through a process, which involves teaching the visual behavior required for different sporting activities. The aim of this study was to determine the differences between high level and low level in saccadic adaptation among female taekwondo players. Ten taekwondo players (high level) from Zagazig University team were participated in the study (mean age 21.20 ± 1.32). Ten taekwondo players (low level) were participated in the study (mean age20.46 ± 0.91) and test results were obtained for saccadic eye movements. All participants were female. Results showed that there were no significant differences between high level and low level of female taekwondo players in saccadic adaptation. The researcher concluded that future research should consider these results and determines the vision tests which strong connect with taekwondo game.

Key words: Eye movements % Taekwondo

INTRODUCTION

Taekwondo is a dynamic form of unarmed self defense that utilizes the entire body and it is known as the kicking art because it can be distinguished from other martial arts by its focus on kicking techniques.

Classification of Taekwondo kicks, can be performed quickly and possess the force to break the bones of an opponent. During competition, over 80% of executed techniques were kicks. There are various styles of martial arts. Some are considered SOFT arts such as Hapkido, because of their emphasis on joint cranks and less striking. They are supposed to be gentler on the opponent while still being effective. Taekwondo is one of the HARD arts, because it emphasizes hard powerful punches and advanced use of the feet. Of all the martial arts, Tae kwon do is known as the Korean kicking art, because of its strong emphasis on kicking. Many martial arts include kicking but the greater emphasis is placed upon hand techniques.

Humans receive information from the external environment through several sensory organs. Vision is the most dominant sense, with 70% of all sensory receptors in the eye [1]. Vision, with components such as visual skills, contributes up to 80% of information obtained [2]. Sports vision can be defined as the study of the visual abilities that are required in recreational and competitive sports, as well as the development of visual strategies for improvement of accuracy, stamina, consistency and hence performance of the visual system [3]. If the visual system is not receiving messages accurately or quickly enough, performance may suffer [4]. It is important for visual systems to be functioning at advanced levels because athletic performance can be one of the most rigorous activities for the visual system [5]. According to Reichow and Stern [6], sports vision encompasses performance orientated comprehensive vision care programs involving education, evaluation, correction, protecting and enhancement of an athlete.

Quick and accurate eye movements are essential to athletic success. Taekwondo require eye movement in a variety of directions. Saccadic eye movements are used to direct foveal fixation towards objects of interest [7]. Saccades depend on information from the periphery of the retina to tell the brain that there is something of interest in the field that should be recognized.

At the 1994 Olympic Games in Lillehammer, from the 342 athletes representing 46 countries and ranging in age from 16 to 41, more than 171 (50%) had never received a comprehensive visual examination [8]. This corresponds with previous results from Garner [9] who concluded that a significant amount of elite athletes compete in their

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specific sports with uncorrected visual defects. This may be because the sports they participate in are perhaps of low visual demand, or they compensate with higher functioning of other skills [10] or they may be performing below their true potential.

Studies in human vision are increasingly addressing the dynamic nature of visual activity [11-13]. Under most situations in which vision is employed, saccadic eye movements are used to scan the visual scene actively at a rate of three or four movements each second. The task of visual search has proved to be a very productive paradigm to investigate active vision [14].

However, to the author knowledge, a systematic analysis of the sports vision involved in Taekwondo game is still lacking. Hence, the aim of this study was to determine the differences between high level and low level in saccadic adaptation among female taekwondo players.

MATERIALS AND METHODS

Participants: Ten taekwondo players (high level) from Zagazig University team were participated in the study (mean age 21.20 ± 1.32). Ten taekwondo players (low level) were participated in the study (mean age 20.46 ± 0.91) .Test results were obtained for saccadic eye movements. All participants were female.

Measurement: Eye movements of participants were recorded via Videonystagmograpy (VNG) (Fig. 1) .Videonystagmography (VNG) is a series of tests used to determine the causes of a patient's dizziness or balance disorders. If dizziness is not caused by the vestibular portion of the inner ear, it might be caused by the brain, by medical disorders such as low blood pressure, or by psychological problems such as anxiety. VNG is a test used to determine whether or not dizziness may be due to inner ear disease.

How does VNG Work?

VNG is a complete diagnostic system for recording, analyzing and reporting involuntary eye movements, called nystagmus, using video imaging technology. Hi-tech video goggles with infrared cameras are worn while you look or lie in different positions.

There are four main parts to the VNG. The saccade test evaluates rapid eye movements. The tracking test evaluates movement of the eyes as they follow a visual target. The positional test measures dizziness associated with positions of the head. The caloric test measures responses to warm and cold water circulated through a small, soft tube in the ear canal. The cameras record the eye movements and display then on a video/computer screen. This allows the examiner to see how the eyes move which is very helpful in assessing balance system health.

Statistical Analysis: All statistical analyses were calculated by the SPSS statistical package. The results are reported as means and standard deviations (SD). Differences between two groups were reported as mean difference ±95% confidence intervals (meandiff ± 95% CI).Student's t-test for independent samples was used to determine the differences in fitness parameters between the two groups. The $p<0.05$ was considered as statistically significant.

RESULTS AND DISCUSSION

Baseline results showed that there were no significant differences between the two groups (high and low levels) in all visual variables (Fig. 2).

This study is the first report on the dynamics of saccadic adaptation in taekwondo and to investigate whether athletes perform better with respect to saccadic adaptation in both positive and negative directions.

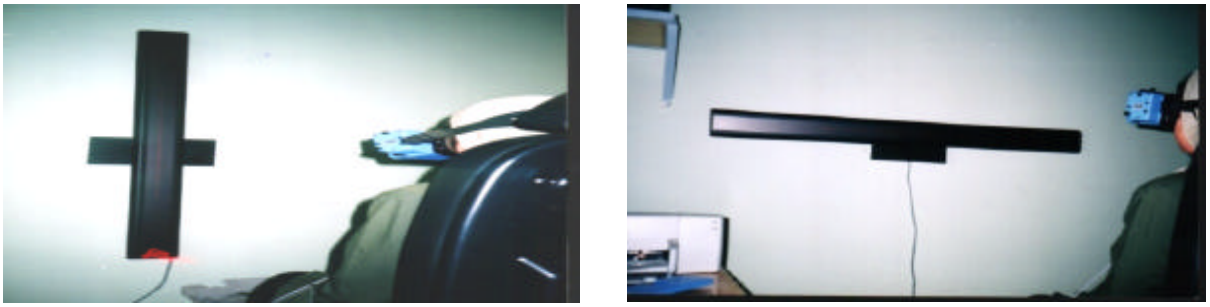

Fig.1: VNG measurement

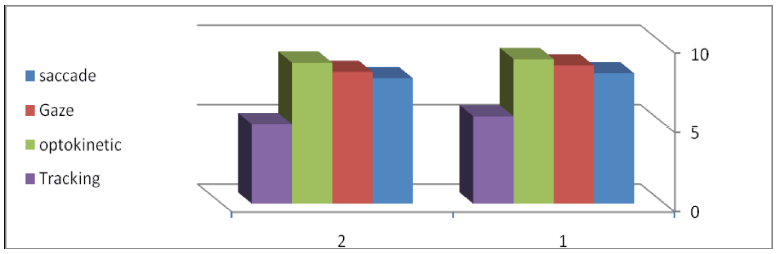

Fig. 2: Differences between high level and low level in eye movements

The results clearly show that there is no change in the magnitude of saccadic adaptation between taekwondo players with high level and low level in both gains increasing and decreasing saccadic adaptation. This supports the idea that the ocular motor system does not tolerate overshooting of the target and also that undershooting is common during saccade execution.

Hence, the time constant for gain reduction is much shorter in comparison to a gain increase. Since the results suggest that magnitude differences in saccadic adaptation between the groups is not significant, this results is consistent with earlier findings in literature [15].

According to Christenson and Winkelstein [16], it has been shown that experience in fast ball games is associated with faster saccadic eye movements and more specifically with antisaccadic eye movements. Antisaccadic latencies were found to be about 50 msec shorter in competitive players than in controls [17]. Lenoir *et al*. [17] indicated that the suggested explanation for this difference was that athletes have better information-processing capacities. During their sport activities, they frequently have to analyze the current situation and select, plan and execute the appropriate action in a very short amount of time. These processes often include the suppression of unwanted, reflex-like responses to a given stimulus before a voluntary response is executed.

Vision is often seen as the ability to perceive, select and to interpret information presented to the system. But when investigating the role of the visual system in sports performance it is important to understand the interaction between environmental demands on the system, optical properties of the eye and the functional properties of the visual perceptual system. Our research does suggest that the visual information processing system and more specific visuomotor control, is far more important than the visual information gathering system when considering sports performance. Thus superior athletes differ from the normal population in their ability to use visual information to control motor action rather than simply relying on visual perceptual skills. An ineffective gathering system may however limit proper visual processing and should therefore not be ignored. According to Milner and Goodale [18], the traditional distinction between the 'what' and 'where' in the visual system should make way for a 'what' and 'how' approach. Thus the emphasis should be to develop. Future research should consider this results and determines the vision tests which strong connect with taekwondo game.

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